What we claim is:

1. The inorganic polymer matrix comprising a reaction product of an alkali silicate, one or more non-silicate network formers and/or reactive glass, water and optionally one or more additives, and one or more network modifiers.

2. The inorganic polymer matrix comprising the reaction product of an alkali base, a silica source, water, one or more non-silicate network formers and/or reactive glass, one or more network modifiers and optionally, one or more fillers.

3. The composition of claim 1, wherein said non-silicate network former comprises an oxoanionic compound.

4. The composition of claim 1, wherein said network modifiers comprises a cation.

5. The composition of claim 4, wherein said cation is a multivalent cation selected from Groups 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 or 16 of the Periodic Table.

6. The composition of claim 4, wherein said cation is an alkaline earth cation.

7. The composition of claim 1, wherein said non-silicate network former comprises an acidic oxoanionic compound.

8. The composition of claim 7, wherein said acidic oxoanionic compound comprises boric acid, phosphoric acid, sulfuric acid, sodium dihydrogen phosphate, disodium hydrogen phosphate, dipotassium hydrogen phosphate, potassium dihydrogen phosphate, ammonium hydrogen phosphate, ammonium dihydrogen phosphate, metallic phosphate salts, nonmetallic phosphate salts or compounds incorporating borate, sulfate, aluminate, vanadate, germanate, or combinations thereof.

9. The composition of claim 1, wherein said non-silicate network former comprises a non-acidic oxoanionic compound.

10. The composition of claim 9, wherein said non-acidic oxoanionic compound comprises trisodium phosphate, potassium phosphate, or sodium borate.

11. The composition of claim 1, wherein said non-silicate network former comprises a mixture of potassium dihydrogen phosphate and boric acid; sodium dihydrogen phosphate and boric acid; potassium dihydrogen phosphate, sodium dihydrogen phosphate and boric acid; or sodium borate and potassium dihydrogen phosphate.

12. The composition of claim 1, wherein said non-silicate network former comprises monobasic potassium phosphate and boric acid.

13. The composition of claim 7, wherein said acidic oxoanionic compound is present in an amount of between about 0.01 wt. % and 20 wt. % based upon the total composition.

14. The composition of claim 1, wherein said reactive glass can be characterized by the following formula:

$$a(A'_2O)_x\, g(G_fO)_y\, c(A''O)_z$$

where **A'** represents at least one alkali metal glass modifier, $\mathbf{G_f}$ represents at least one glass former, A" represents, optionally, at least one glass network modifier, **a** represents the number of fluxing agents present and can range from 1 to 5, g represents the number of glass formers present and can range from 1 to 10, **c** represents the number of glass network modifiers and can range from 0 to about 30, **x** represents the mole fraction of fluxing agent and is between about 0.050 and about 0.150, **y** represents the mole fraction of glass former and is between about 0.200 and about 0.950, **z** represents the mole fraction of glass network modifiers and is between about 0.000 and about 0.500, $\mathbf{x + y + z = 1}$, and $\mathbf{x < y}$.

15. The composition of claim 14, wherein said alkali glass modifier comprises lithium, sodium, potassium, rubidium, cesium or combinations thereof.

16. The composition of claim 14, wherein said glass former comprises boron, silicon, phosphorus, sulfur, germanium, arsenic, antimony, aluminum, vanadium or combinations thereof.

17. The composition of claim 14, wherein said glass network modifier comprises, titanium, chromium, manganese, iron, cobalt, nickel, copper, mercury, zinc, lead, zirconium, lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, actinium, thorium, uranium, yttrium, gallium, magnesium, calcium, strontium, barium, tin, bismuth, cadmium or combinations thereof.

18. The composition of claim 1, wherein said optional additives comprise clay fillers, oxide fillers, gel modifiers, organic toughening agents, or plasticizing agents or combinations thereof.

19. The composition of claim 18, wherein said fillers comprise kaolin, metakaolin, montmorillonites or mica or combinations thereof.

20. The composition of claim 18, wherein said oxide filler is magnesium oxide, zinc oxide or calcium oxide or combinations thereof.

21. The composition of claim 18, wherein said gel modifier is an organic acid or base generally selected from the group consisting of hydroxyacids, N-based bases, P-based bases or combinations thereof.

22. The composition of claim 18, wherein said gel modifier is selected from the group consisting of α-hydroxyacids, β-hydroxyacids, substituted pyridines, quinolines or combinations thereof.

23. The composition of claim 1, further comprising reinforcing fibers.

24. The composition of claim 23, wherein said reinforcing fibers are selected from the group consisting of nickel fibers, nickel-coated carbon fibers, nickel-coated graphite fibers, glass fibers, carbon fibers, graphite fibers, mineral fibers, oxidized carbon fibers, oxidized graphite fibers, steel fibers, metallic fibers, metal-coated carbon fibers, metal-coated glass fibers, metal-coated graphite fibers, metal-coated ceramic fibers; quartz fibers, ceramic fibers, silicon carbide fibers, stainless steel fibers, titanium fibers, nickel alloy fibers, polymeric fibers, aramid fibers, basalt fibers, alkaline resistant glass fibers or combinations thereof.

25. The composition of claim 23 wherein said fibers possess an oxophilic surface.

26. The composition of claim 23 wherein said fibers are coated to enhance oxophilicity.

27. The composition of claim 23, wherein said fibers are in the form of yarns, tows, whiskers, continuous fibers, short fibers, woven fabrics, knitted fabrics, non-woven fabrics, random mats, felts, braided fabrics, or wound tows.

28. A matrix composition comprising:

$$\mathbf{(1\text{-}n)(\ aA_2O : SiO_2 : bB : cC : dD_x\ ) \bullet nH_2O}$$

wherein:

A = (1-z) K_2O or (z)Na_2O, where z can vary between 0 and 1, $\mathbf{K_2O}$ is potassium oxide, and $\mathbf{Na_2O}$ is sodium oxide; Li_2O can be added if desired.

$\mathbf{SiO_2}$ is silica or a combination of various silicas;

$\mathbf{H_2O}$ is water;

a = molar ratio of A_2O : SiO_2, which ranges from 0.05 to 1.0,

b = molar ratio of B : SiO_2, which ranges from 0.001 to 0.500,

c = molar ratio of C : SiO_2, which ranges from 0.0 to 0.250,

d = is the molar ratio of D : SiO_2 and ranges from 0.0 to 2.000,

n = molar ratio of H_2O incorporated into the formulation, for which during initial formulation which ranges from 0.10 to 0.90,

x =the number of additives (D) used to aid in processing and performance of the basic formulation and ranges from 0 to 20,

B = non-silicate network formers, or a reactive glass, or combination thereof,

C = network modifiers such as Mg^{2+}, Ca^{2+}, Zn^{2+}, Al^{3+}, Ti^{4+} derived from multivalent main group metal and/or transition metal compounds such as $Mg(NO_3)_2$, $ZnCl_2$, or a combination thereof or as a metallic component of a reactive glass, and

D = optional additives selected from one or more, alone or in combination, of

(i) reactive fillers or nonreactive fillers or combinations thereof;

(ii) gelation modifiers;

(iii) a surface-active agents selected from an anionic, cationic or nonionic surfactants or combinations thereof; and

(iv) organic-based toughening agents or plasticizing agents or combinations thereof.

29. The composition of claim 28, wherein said non-silicate network former is chosen from the group consisting of phosphate, sulfate, or borate groups.

30. The composition of claim 28 wherein said non-silicate network former is derived from an acidic precursor.

31 The composition of claim 30, wherein said acidic precursor comprises H_3PO_4, H_2SO_4, H_3BO_3 or a combination thereof.

32 The composition of claims 30 or 31 wherein said acidic precursor comprises salts derived from H_3PO_4, H_2SO_4, H_3BO_3 or a combination thereof.

33. The composition of claim 28, wherein said reactive glass comprises an alkali borophosphate or an alkali phosphoborate glass or a combination thereof.

34. The composition of claim 28, wherein said surface-active agents are chosen from the group consisting of alkylaryl sulfonates, quaternary ammonium salts, protonated organoamine salts, hydroxy polymers, organic-inorganic hybrids such as silicones, or combinations thereof.

35 The composition of claim 28, wherein such fillers are chosen from the group consisting of kaolin, smectites, hormites, mica, vermiculite, metakaolin, metal oxides or a combination thereof.

36. The composition of claim 28, wherein said organic based toughening agents are chosen from the group consisting of resins, low molecular weight polymers or high molecular weight polymers or a combination thereof.

37. The composition of claim 28, wherein said gelation modifiers are chosen from the group consisting of an organic base or an organic acid or a combination thereof.

38. The composition of claim 37, wherein said organic base is quinoline.

39. The composition of claim 37, wherein said organic acid is lactic acid or citric acid or a combination thereof.

40 The composition of claim 1 wherein said polymer matrix is coated with a solution to enhance thermal stability or hydrolytic stability or a combination thereof.

41. The composition of claim 40, wherein said solution is a solution of phosphoric acid.

42. The composition of claim 40, wherein said solution is a solution of phosphoric acid and one or more metallic salts.

43. The composition of claim 40, wherein said solution is a solution of a magnesium salt and phosphoric acid.

44. The composition of claim 40, wherein said solution contains a polyvalent metallic salt chosen from the group consisting of aluminum, calcium, zinc, cerium, lanthanum or combinations thereof.

45. The composition of claim 40, wherein said solution contains a polyvalent metallic salt chosen from the group consisting of aluminum, calcium, zinc, cerium, lanthanum and phosphoric acid.

46. The composition of claim 40, wherein said solution contains a monovalent metallic salt chosen from the group consisting of lithium hydroxide, lithium acetate, lithium chloride or combination thereof.

47. The composition of claim 28 wherein said matrix is coated with a solution to enhance thermal or hydrolytic stability.

48. The composition of claim 28, wherein said matrix is coated with a solution to enhance the thermal and hydrolytic stability.

49. The composition of claim 48, wherein said solution is a solution of phosphoric acid.

50. The composition of claim 48, wherein said solution is a solution of phosphoric acid and one or more metallic salts.

51. The composition of claim 47, wherein said solution is a solution of a magnesium salt and phosphoric acid.

52. The composition of claim 47, wherein said solution contains a polyvalent metallic salt chosen from the group consisting of aluminum, calcium, zinc, cerium, lanthanum or combinations thereof.

53. The composition of claim 47, wherein said solution contains a polyvalent metallic salt chosen from the group consisting of aluminum, calcium, zinc, cerium, lanthanum or phosphoric acid or combinations thereof.

54 The composition of claim 48, wherein said solution contains a monovalent metallic salt chosen from the group consisting of lithium hydroxide, lithium acetate, lithium chloride or combination thereof.

55. An inorganic polymer matrix composition comprising a polymer matrix and reinforcement having enhanced level of mechanical strength where the reinforcement exhibits an oxophilic character at the interface formed between the polymer matrix and reinforcement.

56. An inorganic polymer matrix composition comprising a polymer matrix and graphite and carbon reinforcement having enhanced level of mechanical strength due to an improved interface formed between the polymer matrix and reinforcement, wherein said reinforcement is treated by chemical oxidation.

57. An inorganic polymer matrix composition comprising a polymer matrix and graphite and carbon reinforcement having enhanced level of mechanical strength due to the interface formed between the polymer matrix and reinforcement, wherein said reinforcement is treated by thermal oxidation.

58. An inorganic polymer matrix composition comprising a polymer matrix and graphite or carbon reinforcement having enhanced level of mechanical strength due to an improved interface formed between the polymer matrix and reinforcement, wherein said reinforcement is treated by chemical oxidation.

59. An inorganic polymer matrix composition comprising a polymer matrix and graphite or carbon reinforcement having enhanced level of mechanical strength due to the interface formed between the polymer matrix and reinforcement, wherein said reinforcement is treated by thermal oxidation.

60. An inorganic polymer matrix composition comprising a polymer matrix and reinforcement having enhanced level of mechanical strength due to the interface formed between the polymer matrix and reinforcement, wherein said reinforcement is treated by metallization.

61. An inorganic polymer matrix composition comprising a polymer matrix and graphite and carbon reinforcement having enhanced level of mechanical strength due to the interface formed between the polymer matrix and reinforcement, wherein said reinforcement is treated by electrolytic oxidation.

62 An inorganic polymer matrix composition comprising a polymer matrix and graphite or carbon reinforcement having enhanced level of mechanical strength due to the interface formed between the polymer matrix and reinforcement, wherein said reinforcement is treated by electrolytic oxidation.

63. An inorganic polymer matrix composition comprising a polymer matrix and a reinforcement having improved interfacial strength.

64. A composition of claim 55, wherein said oxophilic character is the result of a sizing applied to the reinforcement.

65 A composition according to claim 64, wherein said sizing is an organic-inorganic hybrid sizing.

66. A composition according to claim 64, wherein said sizing comprises an organic polymer and an inorganic oxide particulate.

67. A composition according to claim 64, wherein said sizing comprises polyvinyl alcohol and silica.

68. A composition according to claim 64, wherein said sizing comprises an epoxy and glass frit.

69. A composition according to claim 64, wherein said sizing comprises an epoxy and a reactive glass frit.

70. A composition according to claim 64, wherein said sizing comprises polyvinyl alcohol and a reactive glass frit.

71. An inorganic polymer matrix composition comprising a polymer matrix and a reinforcement having an enhanced level of mechanical strength due to the interface formed between the polymer matrix and the reinforcement, wherein said reinforcement has an irregular or roughened surface or a combination thereof.

72. An inorganic polymer matrix composition comprising an alkali silicate, and a reactive glass.

73. An inorganic polymer matrix of claim 72 wherein said reactive glass comprises an acidic phosphoborate glass.

74. An inorganic polymer matrix of claim 72 wherein said reactive glass comprises an acidic borophosphate glass.

75. An inorganic polymer matrix of claim 72 wherein said reactive glass comprises an acidic phosphoborate and acidic borophosphate glass.

76. An inorganic polymer matrix composition comprising an alkali silicate and potassium dihydrogen phosphate.

77. A reinforced inorganic polymer matrix composition comprising a reinforcement and an alkali silicate wherein the reinforcement exhibits an oxophilic character at the interface formed between the polymer matrix and reinforcement.

78. A reinforced inorganic polymer matrix composition comprising a reinforcement and an alkali silicate wherein the reinforcement exhibits an oxophilic character at the interface formed between the polymer matrix and reinforcement, wherein said reinforcement is treated by metallization.

79. A reinforced inorganic polymer matrix composition comprising carbon or graphite reinforcement and an alkali silicate wherein the reinforcement exhibits an oxophilic character at the interface formed between the polymer matrix and reinforcement, wherein said reinforcement is treated by chemical oxidation.

80. A reinforced inorganic polymer matrix composition comprising carbon or graphite reinforcement and an alkali silicate wherein the reinforcement exhibits an oxophilic character at the interface formed between the polymer matrix and reinforcement, wherein said reinforcement is treated by thermal oxidation.

81 A reinforced inorganic polymer matrix composition comprising carbon or graphite reinforcement and an alkali silicate wherein the reinforcement exhibits an oxophilic character at the interface formed between the polymer matrix and reinforcement, wherein said reinforcement is treated by electrolytic oxidation.

82. A reinforced inorganic polymer matrix composition comprising a reinforcement and an alkali silicate, wherein the reinforcement exhibits an oxophilic character at the interface between the matrix and the reinforcement as a result of the application of sizing to the reinforcement.

83. A composition according to claim 82, wherein said sizing comprises an organic polymer and an inorganic oxide particulate.

84. A composition according to claim 82, wherein said sizing comprises polyvinyl alcohol and silica.

85. A composition according to claim 82, wherein said sizing comprises epoxy and glass frit.

86. A composition according to claim 82, wherein said sizing comprises epoxy and a reactive glass frit.

87. A composition according to claim 82, wherein said sizing comprises polyvinyl alcohol and a reactive glass frit.

88. A composition according to claim 82, wherein the reinforcement comprises carbon fibers, graphite fibers or combinations thereof.

89. A composition according to claim 71, wherein the reinforcement comprises glass.

90. A reinforced inorganic polymer matrix composition comprising a reinforcement and an alkali silicate wherein the reinforcement exhibits an oxophilic character at the interface between the matrix and the reinforcement as a result of a sizing comprising polyvinyl alcohol being applied to the reinforcement.

91. A reinforced inorganic polymer matrix composition comprising a reinforcement and an alkali silicate and wherein the reinforcement exhibits an oxophilic character at the interface between the matrix and the reinforcement as a result of a primer comprising polyvinyl alcohol being applied to the reinforcement.

92. A reinforced inorganic polymer matrix composition comprising a reinforcement and an alkali silicate wherein the reinforcement exhibits an oxophilic character at the interface between the matrix and the reinforcement as a result of polyvinyl alcohol being applied to the composition.

93. A reinforced inorganic polymer matrix composition comprising reinforcement and an alkali silicate wherein the reinforcement exhibits an oxophilic character at the interface between the matrix and the reinforcement as a result of a sizing comprising crosslinked polyvinyl alcohol being applied to the reinforcement.

94. A reinforced inorganic polymer matrix composition comprising a reinforcement and an alkali silicate wherein the reinforcement exhibits an oxophilic character at the interface between the matrix and the reinforcement as a result of a primer comprising crosslinked polyvinyl alcohol being applied to the reinforcement.

95. A reinforced inorganic polymer matrix composition containing a reinforcement comprising a reaction product of an alkali silicate and a phosphoborate glass, wherein the reinforcement exhibits an oxophilic character at the interface between the matrix and reinforcement.

96. A glass composition comprising about 10 mol % to about 50 mol % of phosphorus pentoxide or its salts, acids or precursor forms; about 10 mol % to about 70 mol % of boron oxide; about 5 mol % to about 45 mol % of an alkali oxide and from about 0 mol % to about 30 mol % of an alkaline earth oxide.

97. A glass composition comprising about 20 mol % to about 40 mol % of phosphorus pentoxide or its salts, acids or precursor forms; about 30 mol % to about 60 mol % of boron oxide; about 20 mol % to about 40 mol % of an alkali oxide and from about 5 mol % to about 20 mol % of an alkaline earth oxide.

98. A glass composition comprising about 25 mol % to about 35 mol % of phosphorus pentoxide or its salts, acids or precursor forms; about 45 mol % to about 55 mol % of boron oxide; about 15 mol % to about 30 mol % of an alkali oxide and from about 10 mol % to about 15 mol % of an alkaline earth oxide.

99. A reinforced inorganic polymer matrix comprising the glass composition of claim 94.

100. A reinforced inorganic polymer matrix comprising the glass composition of claim 95.

101. A reinforced inorganic polymer matrix comprising the glass composition of claim 96.

102. A reinforced inorganic polymer matrix composition containing a reinforcement comprising a reaction product of an alkali silicate and the glass composition of claim 96 wherein the reinforcement exhibits an oxophilic character at the interface between the matrix and reinforcement.

103. A reinforced inorganic polymer matrix composition containing a reinforcement comprising a reaction product of an alkali silicate and the glass composition of claim 97, wherein the reinforcement exhibits an oxophilic character at the interface between the matrix and reinforcement.

104. A reinforced inorganic polymer matrix composition containing a reinforcement comprising a reaction product of an alkali silicate and the glass composition of claim 98, wherein the reinforcement exhibits an oxophilic character at the interface between the matrix and reinforcement.

105. The composition of claim 1, wherein said polymer matrix is coated with a solution to enhance thermal and hydrolytic stability.